

Installation and Operation Manual



Primozone® GM-series Ozone Generators



Responsibility and Disclaimer

Primozone accepts responsibility for the reliability and performance of this equipment only:

- If any modifications to the equipment are authorized in writing by Primozone and carried out by an authorized service technician.
- If the electrical installation for powering the equipment complies with all applicable local electrical codes and requirements including, if applicable, IEC requirements.
- If the equipment is used in accordance with its manuals.

Primozone will provide on request, a service manual which contains all necessary circuit diagrams and service information to enable authorized service technicians to repair those parts of this equipment which Primozone considers to be repairable.

Since Primozone has no control over service work which is not performed by authorized service technicians, Primozone will in no way be responsible or liable for any damages resulting from the operation or performance of any device, or any injury caused thereby, after repair has been performed by any person other than a factory representative of Primozone.

Under no circumstances will Primozone be liable for any indirect, incidental, special or consequential damages of any kind, its liability being hereby limited solely to repair or replacement.

Note: Check your local regulations for any restrictions on ozone generators, power connections/regulation etc.



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1 INTRODUCTION

This manual describes the installation and operation process for the Primozone GM-series ozone generators.

All personnel should read the whole manual before installing or operating the ozone generator. It is especially important that all personnel read and understand the “Safety precautions” chapter before handling the generator. Only trained personnel should be allowed to handle the ozone generator. Training is supplied by Primozone

For more information, please contact Primozone at support@primozone.com or telephone +46 (0)46 70 45 70.

1.1 The Primozone GM-series

This manual covers three of the ozone generator models in the Primozone GM-series; GM18, GM12, and GM6.

The ozone output can be set to between 10% and 100% of the maximum capacity at a given concentration of the ozone generators. The maximum capacity at 13,4% ozone concentration is according to the table below.

	GM18	GM12	GM6
Ozone production gO ₃ /h	900	600	300

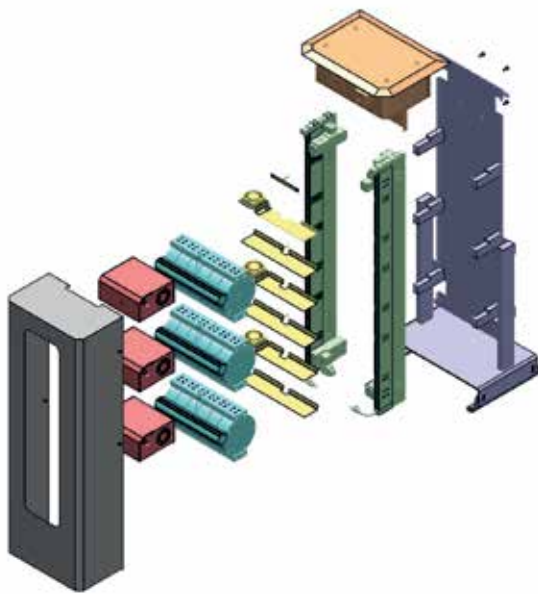
All images in the manual are images of the GM18 ozone generator.

1.2 Basic construction of the GM-series ozone generators

The reactors are installed in groups, called generator blocks, with six reactors per block. As shown in figure 1.

Each generator block has an electrical power unit, a Self-regulating Electrical Power Transformer (SEPT).

The SEPT is mounted on top of the generator block. The ozone generator consist of generator blocks with a corresponding SEPT, a control unit (the module controller) and a set of automatic fuses.



Left to right:

- Front cover (gray)
- 1-3 SEPTs (red) depending on model
- 1-3 generator blocks (turquoise) depending on model
- 1-3 steel plates and 3 ventilating fans (yellow) depending on model
- Protective cover and electrical cabinet with the module controller and the fuse box (orange)
- Aluminum profiles for gas and cooling water (green)
- Stainless steel rack (purple)

Figure 1: Construction of the GM18 ozone generator

1.3 Schematic overview

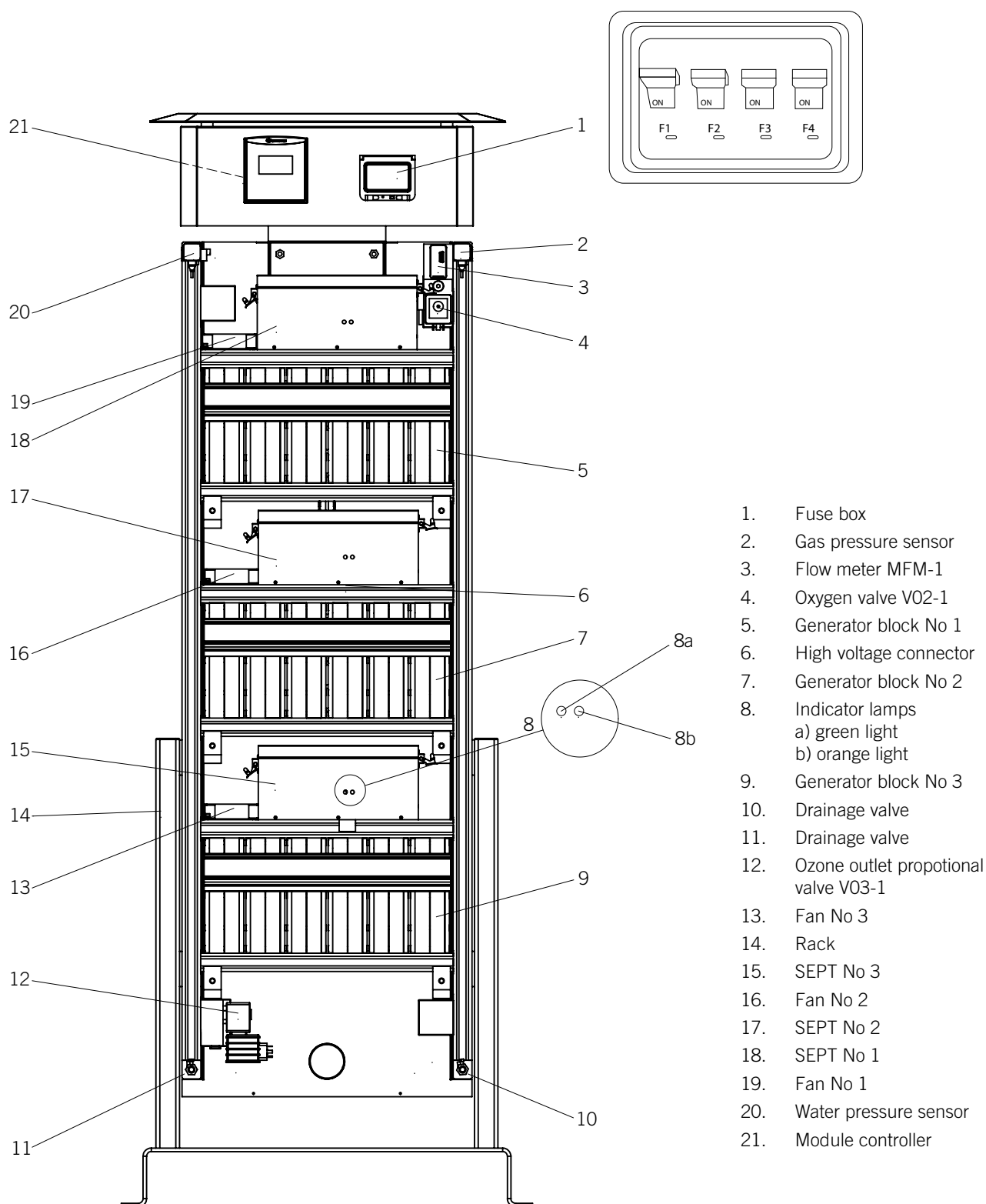


Figure 2: Front view of the Primozone GM18 ozone generator after cover has been removed.

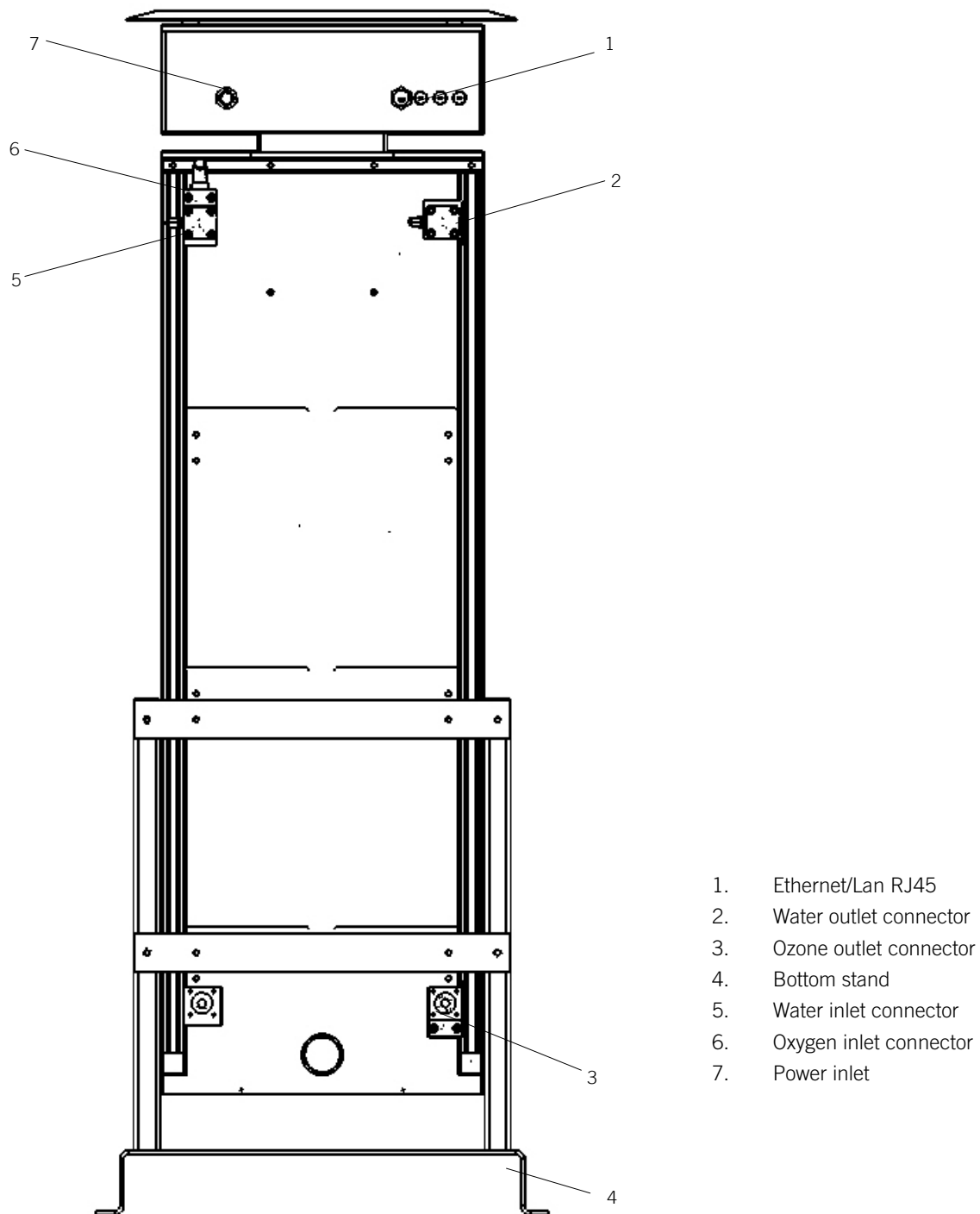


Figure 3: Rear view of the Primozone GM18 ozone generator.

1.4 Warning signs in the manual

This manual contains different messages; WARNINGS, CAUTIONS, RECOMMENDED ACTIONS and NOTES



WARNING (heading in red)

It is mandatory to follow the instructions of a warning message. Failure to do so can cause severe harm or death to personnel.



CAUTION (heading in black)

It is mandatory to follow the instructions of a caution message. Failure to do so can cause harm to personnel or severe damage to equipment.

Warnings and cautions are marked with yellow warning triangles, with different meanings.



WARNING General



WARNING Fire hazard



WARNING Toxic gas



WARNING High voltage

In addition to the warning signs, there are **RECOMMENDED ACTIONS** and **NOTES**.



RECOMMENDED ACTIONS

Necessary security and preventive actions are marked with a blue mandatory sign.

NOTE: A note is marked “Note:” and contains extra information that is useful when handling the ozone generator.

1.5 Warning signs on the ozone generator

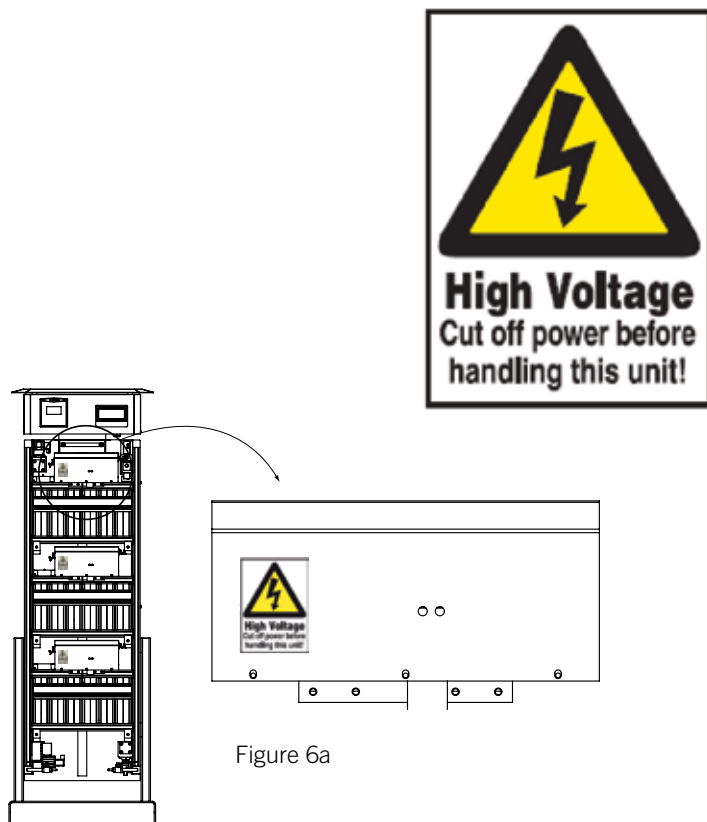


Figure 6a

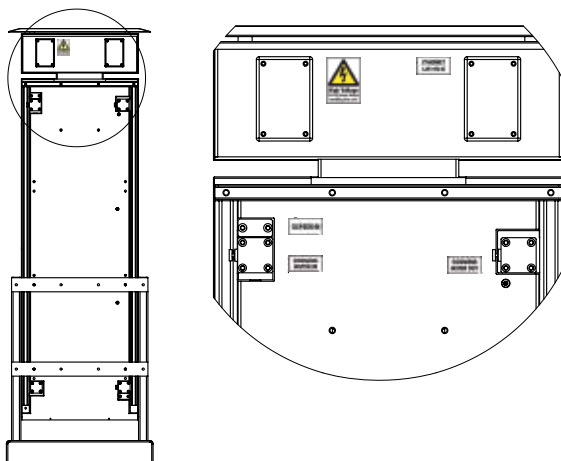


Figure 6b

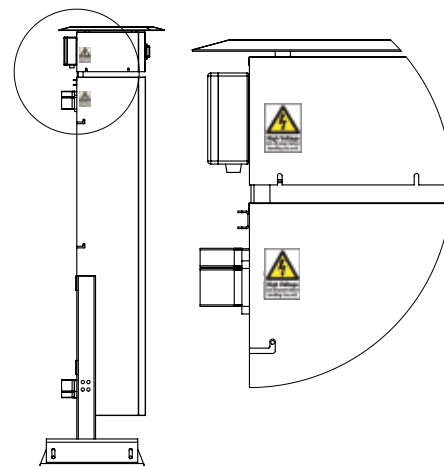


Figure 6c

Figure 6: There are eight warning labels on the GM ozone generator:

- one at the front of each SEPT (figure 6a)
- one at the rear of the GM ozone generator, next to the main power connector (figure 6b)
- two on each side of the GM ozone generator (figure 6c)

2 SAFETY PRECAUTIONS

All personnel must read and understand the safety precautions before installing or operating the ozone generator.

NOTE: In addition to the instructions and guidelines in this manual, make sure to follow all local safety regulations.

2.1 Personnel

All personnel, working with the ozone generator, must use appropriate safety clothing and equipment, in accordance with company policy and relevant local regulations.

NOTE: All personnel operating the ozone generator must be trained by authorized Primozone personnel.

2.2 Emergency stop

It is highly recommended that the ozone generator is equipped with an emergency stop.

NOTE: The emergency stop must be installed according to local regulation. Please check before installing.

Before you reset the emergency stop, make sure that the reason for the stop has been eliminated.



The emergency stop should only be used if there is risk for harm to personnel or damage to the equipment. DO NOT USE THE EMERGENCY STOP FOR NORMAL SHUT DOWN OF THE OZONE GENERATOR.

For a normal shut down:

- Use the module controller for normal stops. See chapter 5.

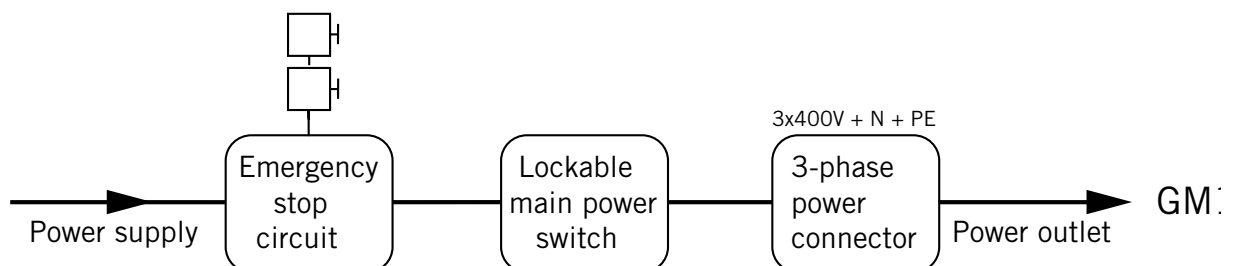


Figure 4: Recommended installation of the emergency stop and power switch. FOLLOW LOCAL REGULATIONS.

2.3 High voltage

The ozone generator has an input voltage of 400V, which is lethal if not properly installed.



Do not remove the covers from a ozone generator unless the main power has been switched off.

Do not remove the covers of the GM-series ozone generators if not trained by Primozone personnel and have a written authorization.



HIGH VOLTAGE

Do not touch any inner electrical parts of the ozone generator. Physical contact with electrical parts can cause severe harm or death. If an accident occurs, immediately call for medical assistance.



LOCK THE MAIN POWER SWITCH

The lockable main power switch must be locked in the OFF position before any work on the electrical components is started.

The main power switch is located near the ozone generator.

Work on electrical equipment must be performed by authorized personnel only.

2.4 Oxygen

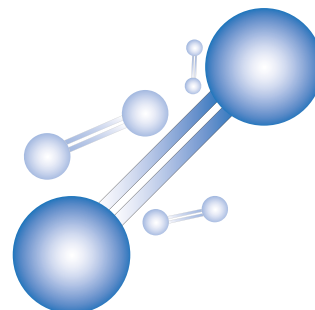
Oxygen is a colorless, odorless and tasteless gas. If there is a leakage of oxygen from the ozone generator, the oxygen content in the air is increased.

Pure oxygen can cause oil and grease to spontaneously combust.



FIRE HAZARD

Do not smoke or light an open flame near the ozone generator. Make sure that you do not leave spill from oil or grease near the ozone generator.



2.5 Ozone

Ozone (O_3) is a pale blue gas with a characteristic odor. It is highly reactive and corrosive and can cause harm if inhaled.



TOXIC GAS

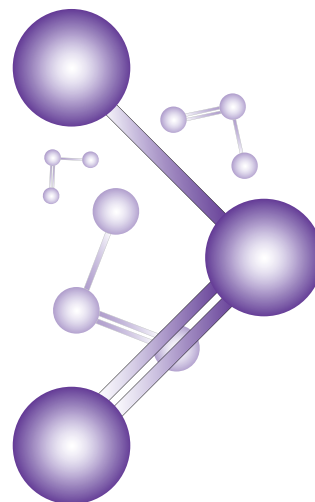
Ozone is a toxic gas. Do not inhale ozone. Install an ozone alarm near the ozone generator. Ensure good ventilation. In case of accident, evacuate the person into fresh air and call for medical assistance.

The human nose can detect ozone at concentrations above 0.02 ppm. The maximum allowable ozone concentration in industrial working areas is 0.10 ppm according to EU regulations, with a permissible human exposure of 8 hours per day, 6 days per week.

Make sure that there is a functional ozone alarm in the room where the ozone generator is installed. The ozone sensor must be located within 2 meters from the ozone generator. Make sure that applicable safety equipment is available.

NOTE: Make sure to follow applicable local regulations!

For more hazard identification on ozone see Appendix C Ozone material safety data.



3 INSTALLATION

Before you remove the transport protection, examine the wooden transport box and make sure that it is free from visible damage. Any damage must be documented and reported to Primozone.

3.1 Mechanical installation

Hoses for gas and cooling water are not supplied with the ozone generator.

Position and install the ozone generator

1. Use a fork lift to move the ozone generator to where it is to be installed. Make sure that the fork is placed under the bottom stand of the ozone generator and that it is stabilized with straps while it is moved. See Appendix B
2. Place the ozone generator where it is to be installed in its upright and vertical position. Make sure that the location has a flat surface and that it is stable.
3. Make sure to have a distance of 0.7 meter behind the ozone generator to assure possible service.
4. Secure the ozone generator to the floor with four 12 mm bolts. See figure 7. The bolts are not supplied with the ozone generator.

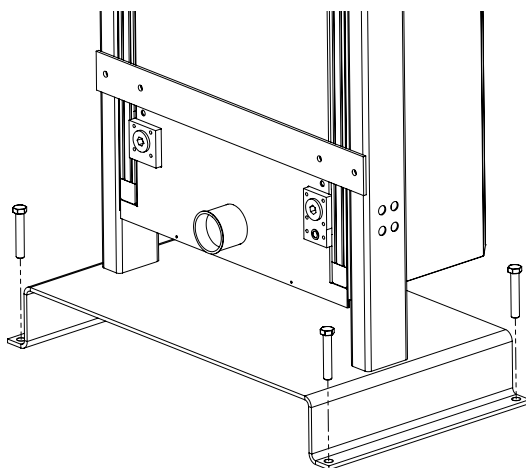


Figure 7: Use four 12 mm bolts (not included) to secure the GM ozone generator to the floor.

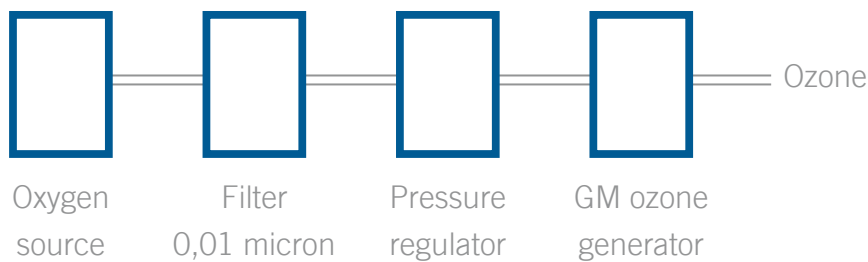
3.1.1 Install the hose for oxygen gas

NOTE:

Hoses are not supplied with the generator. Contact Primozone for a quote.

NOTE!**Before installation:**

- To secure oxygen purity make sure to connect a filter to the hose or make sure that the PSA/oxygen source is fitted with a filter. Filter requirement 0.01 micron.
- The pressure regulator should be placed after the filter and before the ozone generator.



Blow oxygen through the hose before connecting it to the ozone generator to make sure the hose is clean and dry.

1. Connect the hose for inlet oxygen gas to the oxygen gas source. Make sure that the gas hose connector is securely fastened to the oxygen source.
2. Remove the red plastic seal from the oxygen gas inlet (6) at the rear of the ozone generator. See figure 9.
3. Connect the hose to the oxygen inlet (6).

3.1.2 Install the hose for ozone gas

NOTE:

Hoses are not supplied with the generator. Contact Primozone for a quote.

1. Connect the hose for outlet ozone gas to the ozone system. Make sure that the ozone gas hose connector is securely fastened.
2. Remove the red plastic seal from the ozone gas outlet (3) at the rear of the ozone generator. See figure 9.
3. Connect the hose to the ozone gas outlet (3).
4. Make sure to use a proper device to prevent water from flowing backwards into the ozone generator. Contact Primozone for more information.

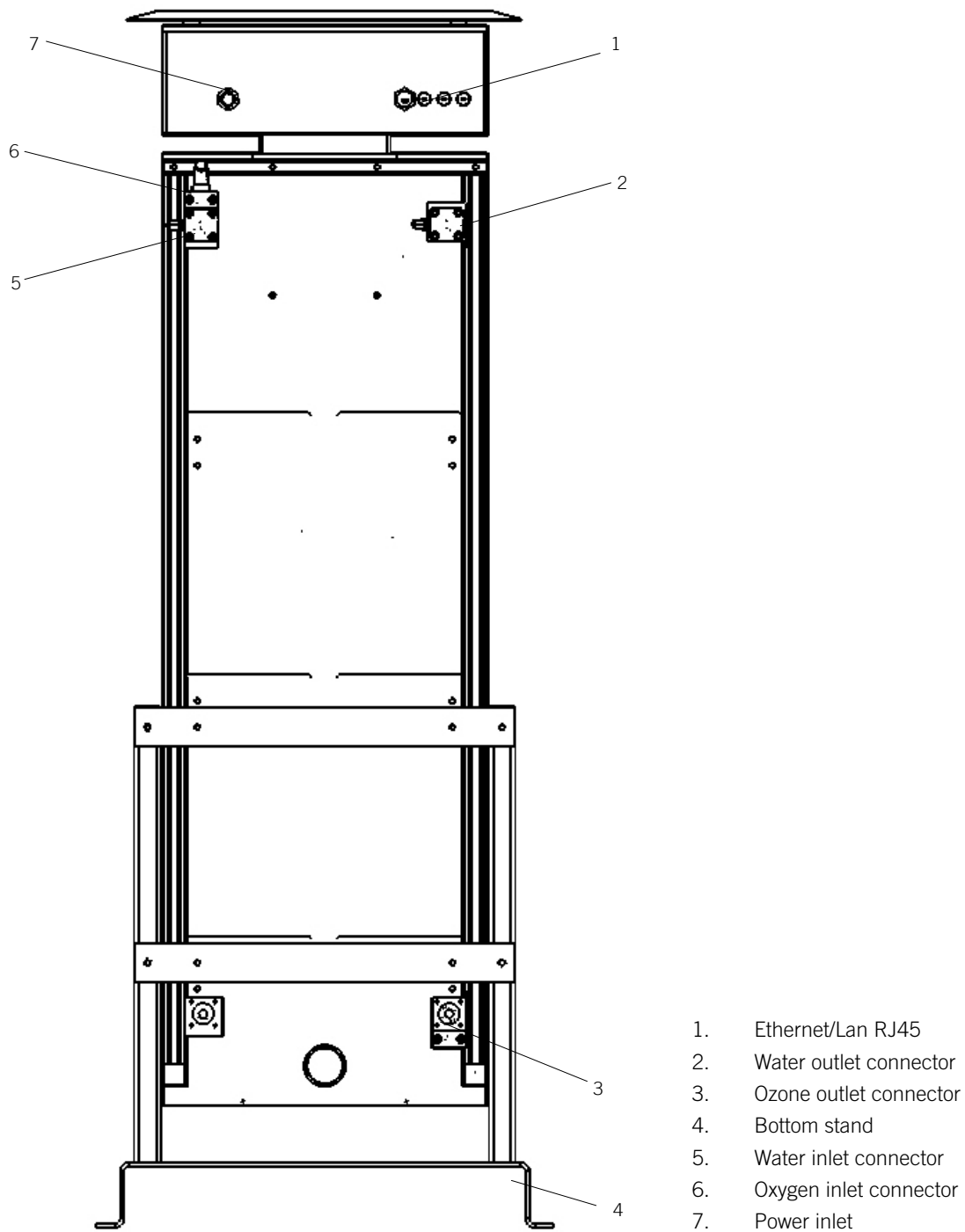


Figure 9: Use four 12 mm bolts (not included) to secure the GM ozone generator to the floor.

3.1.3 Install the hose for inlet and outlet cooling water

NOTE:

Hoses are not supplied with the generator. Contact Primozone for a quote.

1. Connect the hose for inlet cooling water to the water supply and connect the hose for outlet cooling water to the water drain/circulation connector.
2. Remove the red plastic seal at the water inlet (5) and outlet (2) connectors at the back of the ozone generator.
3. Connect the inlet water hose to the inlet water connector (5) and the outlet water hose to the outlet water connector (2).

COOLING WATER QUALITY AND TEMPERATURE

The cooling water quality and temperature is very important for the performance of the ozone generator.



Target temperature: +10°C

Quality: drinking water quality, i.e. particle free and demineralized water or closed loop

For more cooling water requirements refer to Appendix A.5.

3.2 Electrical installation

All electrical installation must be done by authorized personnel and according to local regulations.



ELECTRICITY

The input voltage to the ozone generator is 400 V/230 V and physical contact with electrical parts can cause severe harm or death. If an accident occurs, immediately call for medical assistance.

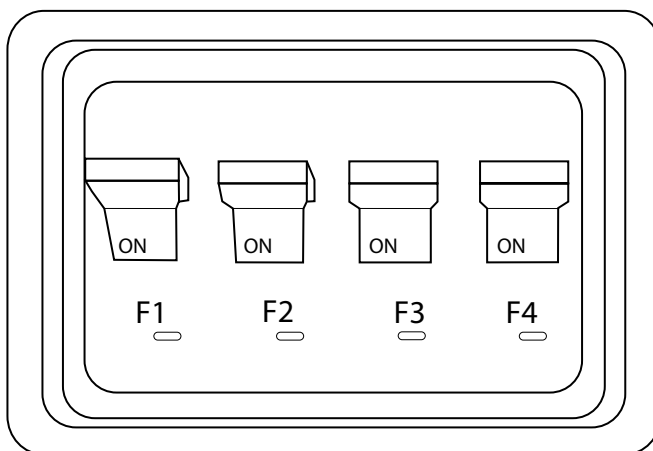
For more electrical requirements refer to Appendix A.2.

3.2.1 Automatic fuses

The ozone generator has two to four automatic fuses, depending on model, which are located in the fuse box at the top of the ozone generator. See figure 11.

The three fuses on the left (F1, F2, F3) are connected to each of the three separate SEPTs. These are 20A fuses. The fuse to the far right (F4) is connected to the module controller of the ozone generator. This is a 2A fuse.

NOTE: All fuses must be in the OFF position when the main power cable of the ozone generator is installed in the power outlet.



- F1 - SEPT No 1 (20A)
- F2 - SEPT No 2 (20A)
- F3 - SEPT No 3 (20A)
- F4 - Module controller (2A)

Figure 11: Automatic fuses on the GM.

3.2.2 Network cable

The network cable must have an RJ45 plug to fit the ozone generator network connector.

To install the network cable, insert the network cable plug into the network cable connector (1) at the rear of the ozone generator. Refer to figure 9.

NOTE: The network cable is not supplied with the ozone generator.

4 OPERATIONS

4.1 Before first start-up - Checklist

Before you start the ozone generator for the first time, make sure that the following preparations have been performed:

- ☐ Make sure that all parts of the ozone production system are installed correctly.
- ☐ Make sure that the ozone alarm is functional in the room where the ozone generator is installed. The ozone sensor must be located within 2 meters from the ozone generator.
- ☐ The ozone generator must be in its upright position and securely fastened to the floor.
- ☐ The inlet hose for oxygen gas must be securely connected to the oxygen supply system
- ☐ Make sure to install a particle filter between the oxygen source and the ozone generator
- ☐ Make sure to purge the oxygen hose prior to connecting it to the ozone generator to make sure it is clean and dry.
- ☐ The outlet hose for ozone gas must be securely connected to the ozone system.
- ☐ The hoses for inlet and outlet cooling water must be securely connected to the cooling water system.
- ☐ Make sure that the four automatic fuses in the ozone generator fuse box are in the OFF position.
- ☐ Make sure that the electrical wall plug of the ozone generator is securely installed in the power outlet.
- ☐ Make sure that the lockable main power switch is in the ON position.
- ☐ Make sure that the pressure, the temperature and the water flow of the cooling water is correct. See section A5 in Appendix A.
- ☐ Open the shut-off valves for inlet and outlet cooling water.
- ☐ Make sure that the oxygen gas pressure is correct. See section A3 in Appendix A.
- ☐ Open the shut-off valves for the oxygen gas supply and for the ozone gas outlet.
- ☐ The inlet for oxygen gas must have a pressure regulator (0-4 bar(g)) and a visible gauge.
- ☐ Make sure to prevent water from flowing backwards into the ozone generator

4.1.1 Environmental requirements

The ozone generator must be operated in an environment that meets the following criteria:	
Air humidity:	Maximum 40%
Air temperature:	Minimum 5°C
Air temperature:	Maximum 40°C
Air quality:	The air must be free of dust, salt particles and conductive materials (like iron powder).
Ozone alarm:	There must be a functional ozone alarm in order to detect ozone leakage. The ozone sensor must be located within 2 meters from the ozone generator.
Make sure that these criteria are not disregarded after the ozone generator has been installed and taken into use.	

4.2 Condensation

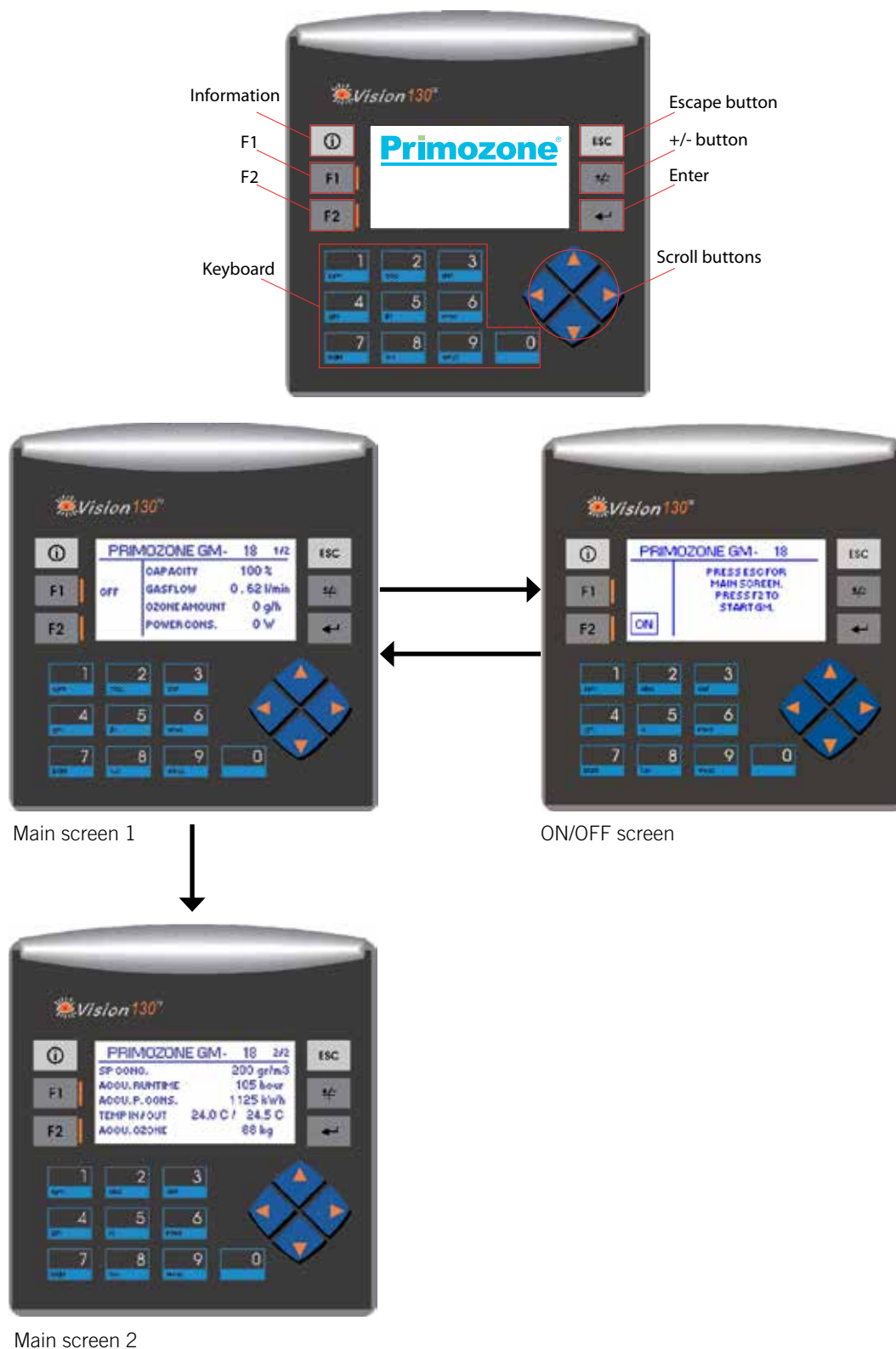
High ambient temperature in combination with low cooling water temperature may cause condensation inside the ozone generator.

Even moderate condensation may cause system malfunction. To avoid this place the generator in dry or air-conditioned environment or connect it to a generator drier (adsorption drier).

Primozone provides generator driers. Ask your local representative for a quotation.

4.3 Module controller overview

4.3.1 Module controller screen overview



4.3.2 General information provided in the module controller

The two main screen pages on the module controller provide all the necessary information to monitor and control the ozone production.

Main screen 1 of 2:

Capacity - This set point can be adjusted to a desired value in percent. E.g. if a generator module produces 900 g O₃/h at a capacity of 100%, reducing the capacity to 50% leads to the same reduction in the ozone production as well.

Gasflow - This process value is affected by the capacity level and cannot be adjusted. When the capacity is increased the gas flow will increase and when the capacity is decreased the gas flow will decrease.

Ozone Amount - This value displays how many grams ozone is produced per hour.

Power Cons. - This value displays the power consumption in watts.

Main screen page 2 of 2:

To display the main screen press the down arrow on the controller. Press the up arrow to browse back to the first page.

SP Conc. - Displays the ozone concentration in grams per cubic meters oxygen gas.

Accu. Runtime - Displays The number of hours the generator module has been in operation.

Accu. P. Cons. - Displays the accumulated power consumption over a specific time period.

Temp in/out - Displays the temperature of the cooling water at the inlet and outlet.

Accu. Ozone - Displays the accumulated ozone produced over a specific time period.



Figure 12
Main screen 1



Figure 13
Main screen 2

4.4 Start-up after installation - purge and dry for 90 min

When the ozone generator is started after installation or has been shut down for more than one week it needs to be purged and dried before use.

To purge and dry the ozone generator do the following.

1. Switch OFF the automatic fuses F1, F2, F3 if applicable.
2. Switch the automatic fuse F4 in the ozone generator fuse box to the ON position to start the ozone generator module controller.
3. Start the ozone generator by pressing F1 (the ON/OFF screen in figure 14 will be displayed). Then press F2 and the generator will start. (to return to the main screen press ESC)



Figure 14: ON/OFF screen

NOTE:

Since only fuse F4 is in the ON position, oxygen gas flows through the ozone generator but the ozone production has not started

4. Set the capacity to 100% by pressing ENTER (arrow) on mail screen 1 (see figure 15). Use keyboard to enter the value and press ENTER (arrow) to confirm.
5. Let the oxygen gas flow through the ozone outlet hose to dry the system.
6. After 90 minutes, stop the ozone generator by pressing F1, then F2.



Figure 15: Main screen 1

NOTE: The proportional valve can take up to two minutes to open after transportation, which can reduce or prevent the gasflow.

4.5 Normal operations

4.5.1 Start-up

NOTE:

Make sure that all relevant automatic fuses are in the ON position.

Make sure that the flow, the temperature and the pressure of the inlet cooling water are according to specification. See section A5 in Appendix A.

Make sure that the flow, the concentration and the pressure of the inlet oxygen gas are according to specification. See section A3 in Appendix A.

Open the shut-off valves for oxygen, ozone and cooling water (if manual).

1. Start the ozone generator by pressing F1 (the ON/OFF screen in figure 14 will be displayed). Then press F2 and the generator will start. (to return to the main screen press ESC)

4.5.2 Set ozone capacity

2. Set the capacity to desired value by pressing ENTER (arrow) on main screen 1 (see figure 15). Use keyboard to enter the value and press ENTER (arrow) to confirm.



CAUTION

Make sure that the indicators in the front of the SEPTs show a steady green light within one minute after the ozone generator was started. If one of the indicators remains orange for more than one minute, refer to Appendix E.

NOTE:

When all four automatic fuses are in the ON position and the ozone generator has been started, the ozone production starts.

If a SEPT indicator lamp remains orange for more than one minute after start, refer to Appendix E.

4.5.3 Shut-down

1. Shut-down the ozone generator by pressing F1 (the ON/OFF screen in figure 14 will be displayed). Then press F2 and the generator will stop (return to main screen press ESC).

NOTE:

When the generator is shut off, it prior automatically purges for 3 minutes.

If contact with the module controller is lost, use the lockable main power switch to shut down the ozone generator.

In case of emergency, or if there is risk for harm to personnel or to the equipment, use the emergency stop to shut down the ozone generator. The emergency stop is located on the main power supply cable.

Do not use the emergency stop for a normal stop of the ozone generator.

4.5.4 Local or Remote control

When the module controller is connected to a system controller, the control status will be displayed on main screen 1. (see figure 16) To change between local and remote simply press the F2 button.



Figure 16
Main screen 1

4.5.5 Alarms overview

The controller indicates that an active alarm has occurred when the Primozone caption on the main screen flashes (see figure 17).

4.5.5.1 Alarm state

There are three different types of alarms:

1. Acknowledged active alarms
2. Unacknowledged active alarms
3. Unacknowledged non-active alarms

Note: Depending on system lay-out, the alarm set-up could have a different content and appearance compared to below information.



Figure 17

4.5.5.1 Shut-down alarms

1. Gas Pressure is above 2,2 bar(g)
2. Cooling water temperature is above 40 C
3. Cooling water pressure is below 0,2 bar(g)
4. Gas Pressure is below 0,5 bar(g)

4.5.5.1 Communication error alarms

1. Communication error SEPT 1
2. Communication error SEPT 2
3. Communication error SEPT 3
4. Communication errors Modbus Master

4.5.5.1 Alarm menu

To open the alarm menu press keyboard button 8 main screen 1 (fig. 18)

The alarms are arranged in groups where group 0, General Collection, is the default group (refer to figure 19). This display shows all groups that contain one or more pending alarms. If the alarms in a group are no longer pending, the group is not displayed.

- ID : Displays the group ID number.
- Count : The number of alarms in the group.
- Group Name :The name assigned to the group.

To see the whole text of the group name use the left and right scroll buttons to roll the text.

Press Enter for more details of the alarms in a specific group.

Figure 20 shows the all the details of the alarms such as; the alarms ID, the time when it occurred, if it's acknowledged and the name of the alarm. To see the whole text of the alarm name use the left and right scroll buttons to roll the text.



Figure 18



Figure 19



Figure 20

To acknowledge an alarm, use the up and down arrows to scroll to the desired alarm and press ENTER (refer to figure 20).

To acknowledge a specific alarm press the F2 button. When the alarm is acknowledged the “Active” and the “Ack” text (marked in figure 24) disappears, indicating that the alarm has been acknowledged and not active anymore.



Figure 21

To go backwards to the alarms menu, after an alarm has been acknowledged, press the ESC button and choose another alarm to acknowledge.

Another way to browse between the alarms in a specific group is to use the up and down arrows.



Figure 22

4.5.5.1 Alarm history

An alarm is added to the history buffer after it has become inactive (when the cause of the alarm has been fixed) and not only when the alarm had been acknowledged. The history displays records the time the alarm became active, the time it became inactive, and when acknowledge was performed. To access the alarm history press keyboard button 9 from the main menu screen.



Figure 23

Every alarm has its rise (active) and fall (inactive) date and time, which can be seen in the alarm history menu (refer to figure 24). To see the whole text of the alarm name use the left and right scroll buttons to roll the text.



Figure 24

To browse between different alarms in the alarm history use the up and down arrows.



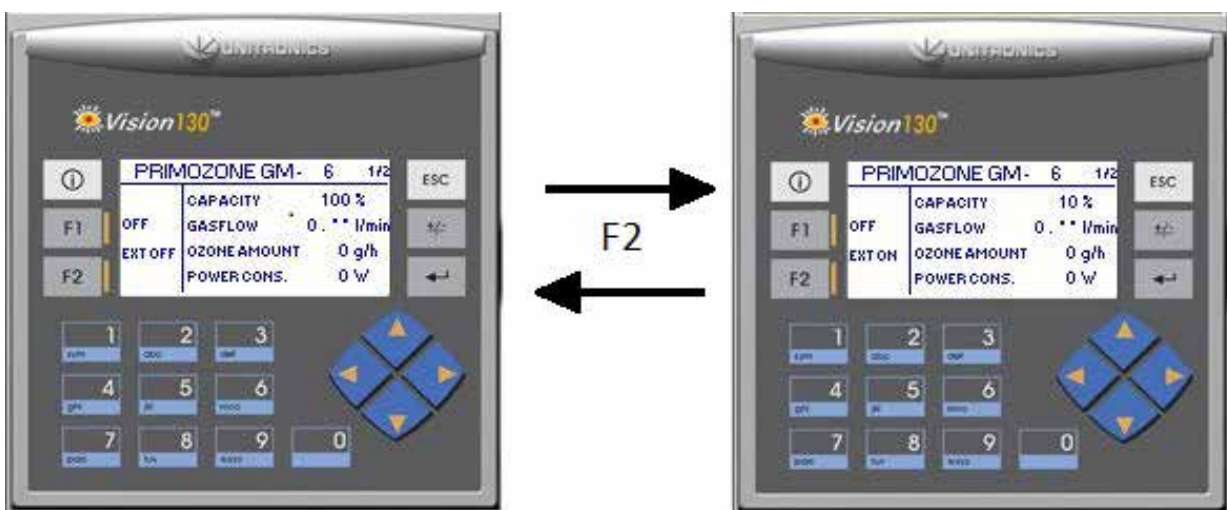
Figure 25

4.6 External control - optional

External control is a Hardware and Software add-on that can be purchased to the generators in the GM-series.

4.6.1 Module controller

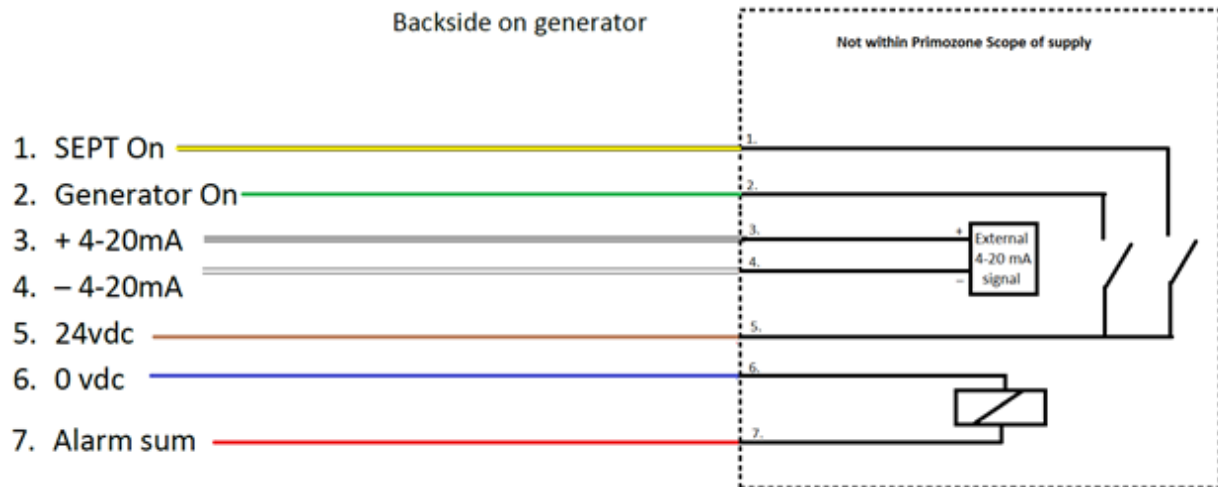
By pressing F2 the operator can turn on/off the external control. By turning off the external control, the operator is able to control the system via the module controller, according to previous description. By turning on the external control the operator can control the system via the IO-interface described below.



4.6.2 Hardware (IO-interface)

The external control comes with a 2 m long cable that is stripped at the end, with 7 cables coming out, each having a ferrule. The user is able to do the following with this function:

- Turn ON the generator by giving a high signal to the Generator ON IO (green cable and the number 2 on it).
- Turn OFF the generator by giving a low signal to the Generator ON IO.
- Purge the system, by having the Generator ON high and the SEPT ON low. The purging rate is now depended of the 4-20 mA input. The system shall be purged for 90 minutes with full capacity (20 mA).
- Turn on the system by having both the Generator ON and the SEPT ON IOs high and change the ozone production rate by changing the 4-20 mA input.
- Monitor if there are any alarms that shuts down the generator. High signal means that the system is running and low signal means that the system has shut down itself in order to protect itself.



APPENDIX A: TECHNICAL SPECIFICATIONS

A.1 DIMENSIONS

	GM18	GM12	GM6
Weight:	280 kg	230 kg	125 kg
Height:	1900 mm	1900 mm	1100 mm
Width (footprint):	650 mm	650 mm	650 mm
Depth (footprint):	460 mm	460 mm	460 mm
Sealing grade:	IP21	IP21	IP21

A.2 ELECTRICAL DATA

	GM18/GM12	GM12	GM6 in GM18 shell	GM6
Power supply:	3x400 V + N + PE, AC 50/60 Hz	3x400 V + N + PE, AC 50/60 Hz	3x400 V + N + PE, AC 50/60 Hz	1x230 V + N + PE, AC 50/60 Hz
Power connector	32 A power plug	32 A power plug	32 A power plug	1 phase power plug
Power cable	3 meters, 5 x 2.5 mm ² rubber cable	3 meters, 5 x 2.5 mm ² rubber cable	3 meters, 5 x 2.5 mm ² rubber cable	3 meters, 3 x 2.5 mm ² rubber cable
Power consumption at 100% capacity	10.8 kW	7.2kW	3,6 kW	3,6 kW
Power factor	0.99	0.99	0.99	0.99
Control range	10-100 %	10-100 %	10-100 %	10-100 %
Safety fuse	Automatic fuse	Automatic fuse	Automatic fuse	Automatic fuse

A.3 OXYGEN GAS SUPPLY

Gas pressure at inlet:	2.2 bar(g)
Gas flow range:	GM6: 10 to 50 liters per minut GM12: 10 to 100 liters per minut GM18: 10 to 150 liters per minute
Oxygen purity:	94% - 98%
Oxygen dew point:	-70°C at 1 bar(a)
Hose, oxygen gas:	1.5 meter, stainless steel flexible hose (not included in a standard delivery)
Connector:	internal 1/2" BSP thread, external 1/2" NPT can be provided upon request.
Micro filter:	0.01 micron

A.4 OZONE GAS

Ozone pressure:	1.5-2.2 bar(g) (at the ozone generator outlet valve, depending on the flow)
Ozone production:	30 to 900 grams ozone per hour at 200 grams ozone/Nm ³ oxygen depending on model
Concentration:	Std: 200 grams ozone/Nm ³ oxygen Min: 150 grams ozone/Nm ³ oxygen Max: 300 grams ozone/Nm ³ oxygen
Power consumption:	12 kWh per kg ozone at a water temperature of 10°C and an ozone concentration of 200 g/Nm ³ oxygen
Hose, ozone gas:	1.5 meter, stainless steel flexible hose (not included in a standard delivery)
Hose connector:	internal 1/2" BSP thread

A.5 COOLING WATER

	GM18	GM12	GM6
Water flow:	2 m ³ /hour	1,33 m ³ /hour	0,67 m ³ /hour

Temperature range:	+3°C to +20°C
Target temperature:	+10°C
Water pressure range:	0.7 bar(g) to 6 bar(g)
Water pressure drop:	0.4 bar
Water quality:	drinking water (98/83/EG) or a closed water loop system
Water hardness:	< 10° DH to avoid lime scaling
Water hose:	2 meter steel-coated hose
Hose connector:	internal 3/4" BSP thread

A.6 MATERIALS

Cover and rack:	Stainless steel, glass
Hose, cooling water:	Steel-coated rubber
Hose, oxygen gas:	Flexible stainless steel
Hose, ozone gas:	Flexible stainless steel

A.7 NOISE

Noise level:	< 55 dB
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A.8 CONTROL SIGNAL

Communication:	Network
Controller:	PLC-based control system

A.9 WARRANTY AND SERVICE AGREEMENT

Refer to separate agreements for warranty and service.

A.10 APPROVAL

The Primozone ozone generators are CE-approved according to the Low Voltage Directive 2006/95/EU (EN60204-1:2006), and it is EMC certified according to EN610000-6-4:2007.

A.11 DISPOSAL

When the ozone generator is to be disposed of, all the electrical components and other materials must be taken care of in accordance to local regulations for electronic and industrial waste.

The ozone generator does not contain any radiating or otherwise hazardous materials that require special destruction.

Please make sure to follow local regulations when disposing the ozone generator and use a possibilities to recycle materials that are recyclable.

A.12 AIR

- Minimum air temperature: 5°C
- Maximum air temperature: 40°C
- Maximum air humidity: 60%
- The air must be free of dust, salt particles and conductive materials (like iron powder).

A.13 ELECTROMAGNETIC COMPATIBILITY

The ozone generators are EMC-approved according to international standard (EN 61000-6-4:2007).

APPENDIX B: HANDLING AND TRANSPORT

When in transport, the ozone generator must be handled with care. Keep it vertical and make sure that it is kept dry and well protected from physical impact.

Use a fork lift to move the ozone generator. Make sure that the fork is placed under the bottom stand and that the ozone generator is stabilized by straps. See figure 26. Do not move the ozone generator by lifting it by any of its parts.

Make sure that the following precautions are taken into consideration when you move, handle or transport the ozone generator:

- The electrical components of the ozone generator must not be exposed to water, oil or chemicals.
- The ozone generator must not be exposed to temperatures higher than 55°C during handling or transportation.
- Avoid rapid changes of the surrounding temperature as this can cause condensation inside the ozone generator, which can damage the electrical parts.
- Drain all cooling water from the ozone generator before it is transported. Refer to Appendix C.

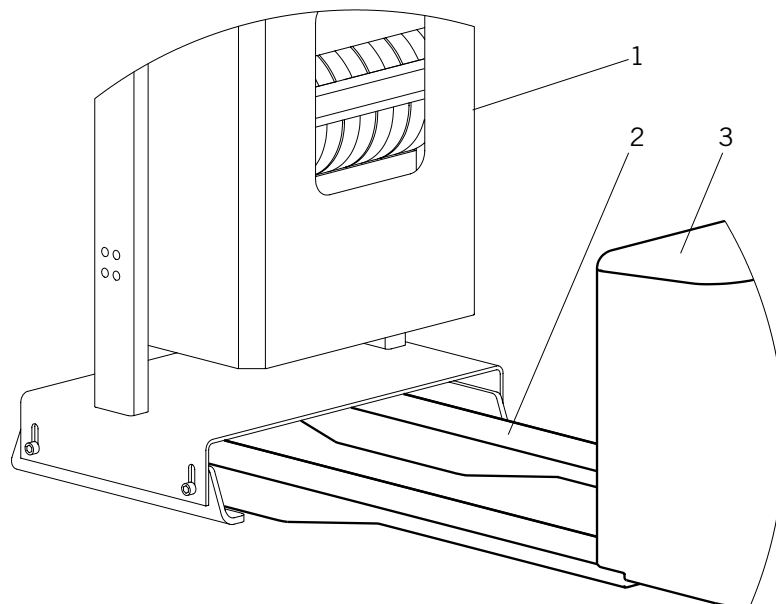


Figure 26: When you use a fork lift to move the ozone generator, make sure that the fork is placed under the bottom stand. Do not lift the ozone generator by any of its parts

APPENDIX C: OZONE MATERIAL SAFETY DATA

An updated Ozone Material Data Sheet is to be found at www.primozone.com/datasheets



APPENDIX D: INSPECTION

D.1 VISUAL INSPECTION

In addition to the system control monitoring of the ozone generator, regular visual inspections must be performed to ensure that the ozone generator is running smoothly.

This manual lists inspections for daily or weekly checks. For inspections that are performed less frequently, please refer to the ozone generator Maintenance manual.

D.2 DAILY VISUAL INSPECTION

Do a visual inspection of the ozone generator every day when it is in use. Check the following:

- **SEPT indicators**

Make sure that the indicator lamp in the front of each SEPT shows a steady green light. If one of the SEPTs has an orange indicator light, refer to Appendix B.

- **Automatic fuses**

Make sure that all four automatic fuses in the fuse box are in the ON position. If any of the fuses is in the OFF position, refer to Appendix B.

- **Condensation**

Examine the ozone generator for condensed water, especially around the connector for inlet cooling water. If there is excess condensation, make sure that the environment complies with the required conditions. Refer to the ozone generator Installation manual.

- **Sound**

Listen for noises from the ozone generator. If any unusual noises are heard, examine the ozone generator for leakage or contact Primozone Production AB.

- **Ozone production**

Make sure that the ozone production complies with the requested specification. Refer to the ozone generator Module Controller manual for instructions on how to read and set the ozone production parameters.

D.3 WEEKLY VISUAL INSPECTION

In addition to the daily inspection, a weekly check of the ozone generator must be performed. Check the following:

- **Environment**

Make sure that the temperature and the air humidity are within specifications in the room where the ozone generator is installed. Refer to section 4 for specifications.

Refer to the ozone generator Module Controller manual for information on how to read and set the system parameters.

- **Oxygen gas**

Make sure that the gas regulator for the oxygen supply shows the specified value. Refer to section A3 in Appendix A.

- **Cooling water**

Make sure that there are no leaks from the cooling water connectors at the rear of the ozone generator.

Make sure that the pressure, the temperature and the water flow of the cooling water are within specifications. Refer to A5 in Appendix A.

APPENDIX E: ALARM SIGNALS AND TROUBLE SHOOTING

E.4 SEPT-ALARMS

	Alarm signal	Probable cause	Recommended action
	SEPT Alarm 0	High voltage too high.	Check incoming power
	SEPT Alarm 1	High Voltage too low.	Check incoming power
	SEPT Alarm 2	Main voltage too high or too low.	Check incoming power
	SEPT Alarm 3	Heat sink temperature.	Check cooling water (both temperature and flow) Check that the SEPT is firmly mounted on the cooling bar
	SEPT Alarm 4	Transistor temperature.	Check cooling water (both temperature and flow)
	SEPT Alarm 5	Air temperature.	Check the cooling fan in the SEPT
	SEPT Alarm 6	Frequency high.	Check reactors ability to maintain potential.
	SEPT Alarm 7	Frequency low.	Check reactors ability to maintain potential.
	SEPT Alarm 12	Power read over absolute max limit.	Check incoming power
	Communication error SEPT 1	Running the generator with fuse F1 off Communication error on RS485	Switch on fuse and reset error. Check cable
	Communication error SEPT 2	Running the generator with fuse F2 off. Communication error on RS485	Switch on fuse and reset error. Check cable
	Communication error SEPT 3	Running the generator with fuse F3 off Communication error on RS485	Switch on fuse and reset error. Check cable

E.5 OTHER ALARMS

	Alarm signal	Probable cause	Recommended action
	One of the fuses is in the OFF position	Error in the SEPT or a reactor	Contact Primozone Production AB
	Gas pressure is below 0,5 bar	Low gas pressure	Make sure that the oxygen gas supply system works according to specification.
	Gas pressure is above 2,2 bar	High gas pressure	Make sure that the oxygen gas supply system works according to specification.
	Cooling water temp above 40°C	No cooling of the generator	Make sure the cooling system is ON. Check valves
	Cooling water low flow or pressure	Cooling water pressure or flow to low	Make sure the cooling system is ON. Check valves
	Low flow OM	Gas flow below 30% of capacity	Make sure that the oxygen gas supply system works according to specification.
	Gas flow alarm	To large difference between the setpoint and the measured value	Check the oxygen flow and pressure
	Low gas flow	This is a warning	Check ozone valves and backpressure
	LOX deviation	To large difference between the setpoint and the measured value	Check compressed air pressure
	LOX low pressure	Dry air pressure below 2,5 bar	Check compressed air pressure
	Other		Contact Primozone Production AB

APPENDIX F: SPARE PARTS LIST AND SEPT REPLACEMENT

Spare parts that are available for the ozone generator are listed in the table below.

Please contact Primozone Production for more information on the spare parts and instructions on how to install them on the ozone generator

	Article	Article No
1	SEPT (Self-regulating Electronic Power Transformer)	100.027
2		
3		
4		
5		
6		
7		

F.1 CHANGING SPARE PARTS

Normally, all maintenance work is done by Primozone Production AB. However after going through the Primozone service education, the changing of a SEPT can be performed by the owner of the GM ozone generator.

F.1.1 Removing the steel front cover

In order to perform any maintenance operations or to drain the GM18 of cooling water, the front cover must be removed. Always keep the lockable main power switch locked in the OFF position when you remove the front cover.

F.1.1.1 Remove the front cover

1. Use the system controller to stop the GM18.
2. Turn off the main power supply and lock the switch.



HIGH VOLTAGE

Do not touch any inner electrical parts of the GM18. Physical contact with electrical parts can cause severe harm or death. If an accident occurs, immediately call for medical assistance.



LOCK THE MAIN POWER SWITCH

The lockable main power switch must be locked in the OFF position before any work on the electrical components is started.

3. Remove the two bolts (2) and nuts (3) from the bottom of the front cover. Refer to figure 27.
4. Loosen the four bolts (5) that hold the front cover to the GM18. There are two bolts on each side of the generator.
5. Lift off the cover upwards and outwards.

F.1.1.2 Install the front cover

1. Position the steel cover (1) on the GM18. Refer to figure 27.
2. Tighten the four bolts (5) that hold the steel cover in place. There are two bolts on each side of the GM18.
3. Install the two bolts (2) and the two nuts (3) at the bottom of the steel cover.

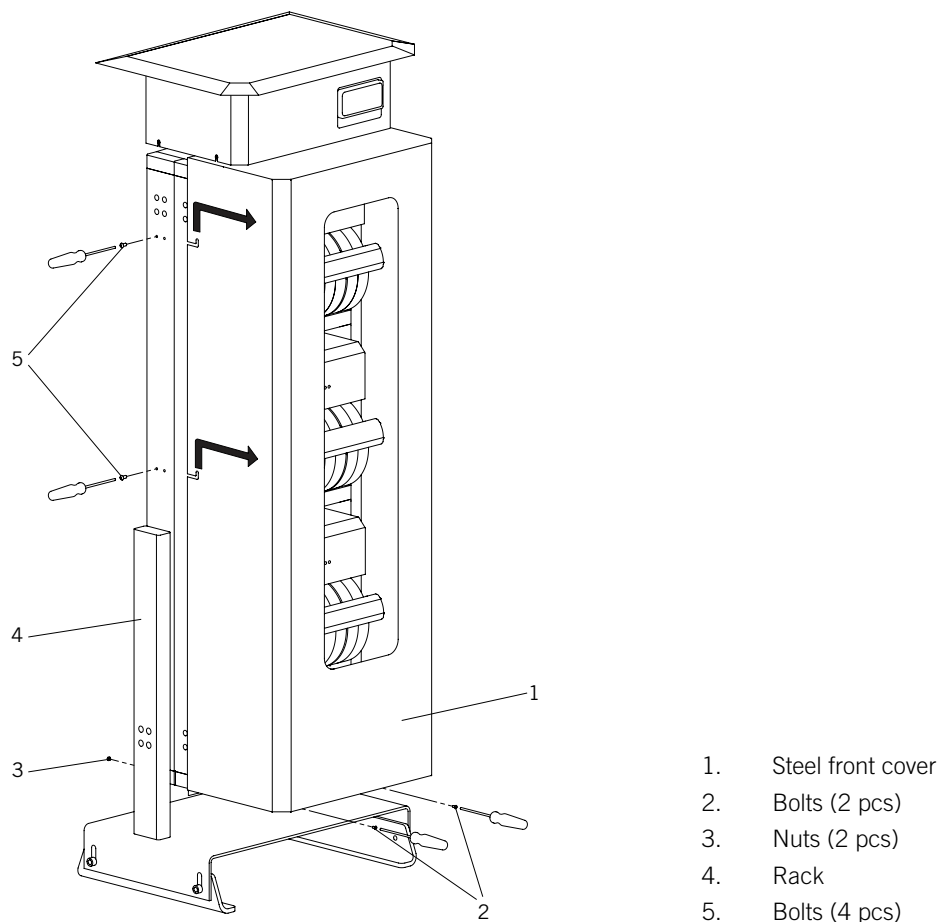


Figure 27: How to remove the steel front cover of a GM ozone generator

F.1.2 Changing a SEPT

The GM18 has three electrical power units, called SEPTs (Self-regulating Electronic Power Transformer). Indications that one or more SEPTs must be changed are, for example:

- a power drop in the SEPT
- decreased ozone outlet
- an orange indicator light in the front of the SEPT

Before you change a SEPT, make sure that a faulty SEPT is the source of the problem.

F.1.2.3 Removing a SEPT

1. Remove the front cover of the GM18 to get access to the SEPTs.



WARNING

Make sure that the lockable main power switch is locked in the OFF position before you start to remove the SEPT.

2. Open the cable lock (2) on the SEPT power supply connector (1). Refer to figure 28.

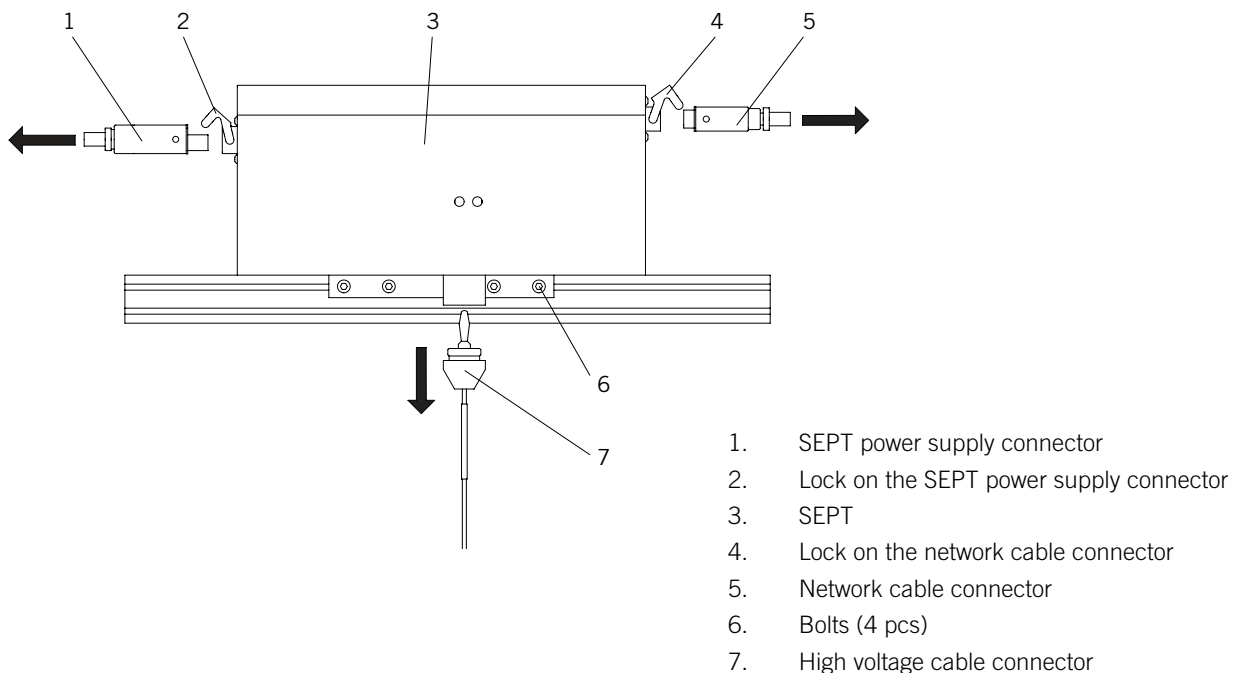


Figure 28: How to remove the cables from the SEPT

3. Pull the SEPT power supply connector (1) straight out from the GM18.

**CAUTION**

Do not pull at the cable to remove it, pull at the cable plug.

4. Open the cable lock (4) on the network cable connector (5).
5. Disconnect the network cable connector (5) from the GM18.
6. Unscrew the high voltage cable connector (7) and pull it straight down to remove it from the GM18.
7. Loosen the four bolts (5) from the front of the SEPT. Refer to figure 29 .

Note: The SEPT is now free to be removed from the GM18.

8. Lift the front of the SEPT slightly, so that it does not touch the aluminum plate (6).
9. With the front slightly lifted, carefully push the SEPT toward the rear of the GM18, so that the steel list (7) under the SEPT is pushed out from the groove at the back of the aluminum plate (6).
10. Lift the SEPT up and then out from the GM18.

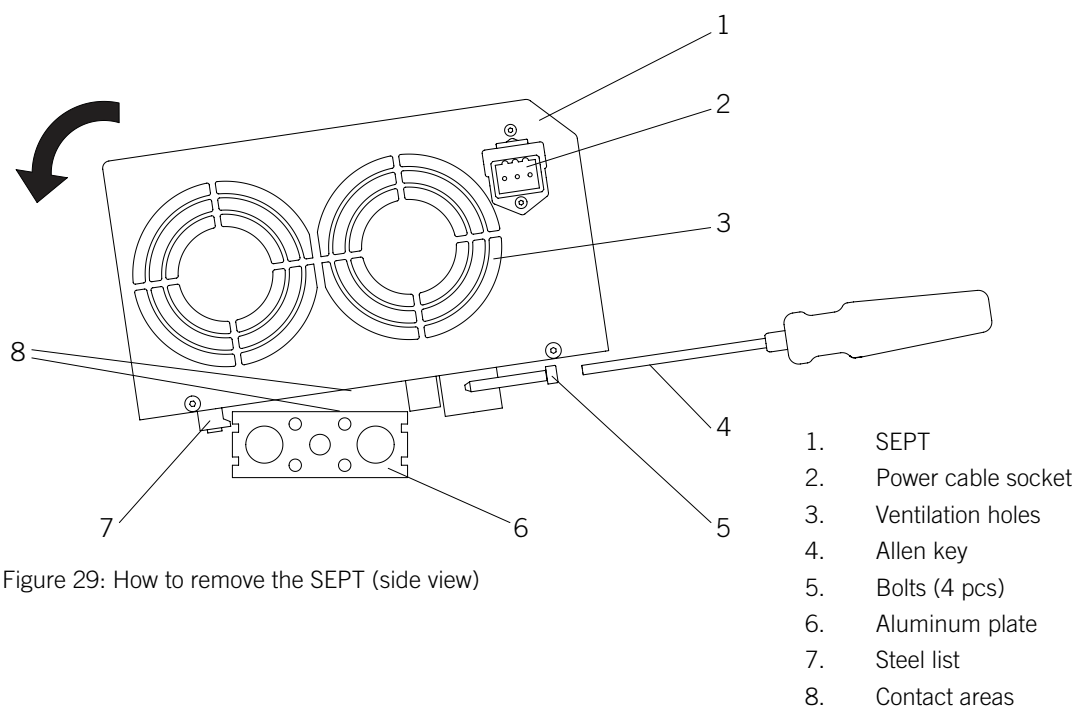


Figure 29: How to remove the SEPT (side view)

1. SEPT
2. Power cable socket
3. Ventilation holes
4. Allen key
5. Bolts (4 pcs)
6. Aluminum plate
7. Steel list
8. Contact areas

F.1.2.4 Installing a SEPT

Before you start to install the SEPT, make sure that the lockable main power switch is locked in the OFF position.



HIGH VOLTAGE

Do not touch any inner electrical parts of the GM18. Physical contact with electrical parts can cause severe harm or death. If an accident occurs, immediately call for medical assistance.



LOCK THE MAIN POWER SWITCH

The main power must be switched off and the main power switch must be locked in the OFF position before any work on the electrical components is started.



CAUTION

The aluminum plate and the bottom of the SEPT must be clean from dirt, dust and other particles.

1. Place the SEPT in the GM18:
 - a. Hold the SEPT as high up as possible in the space where it is to be installed, and lift it into and toward the rear of the GM18. Avoid touching the aluminum plate (6) and make sure that no dirt falls into the greasing oil.
 - b. Tilt the SEPT slightly and lower it carefully, so that the steel list (7) under the SEPT goes behind the aluminum plate.
 - c. With the SEPT still slightly tilted, pull it toward you, so that the steel list (7) under the SEPT goes into the groove at the back of the aluminum plate.
 - d. Carefully put the SEPT down on the aluminum plate while pulling it toward you.
 - e. Make sure that the SEPT is firmly set and that there is no gap between the SEPT and the aluminum plate.
2. Tighten the four bolts (5) that hold the SEPT to the GM18.
3. Install the high voltage cable connector (7) in the SEPT. Refer to figure 28.
4. Turn the connector on the high voltage cable (7), so that the cable is securely fastened to the SEPT.
5. Install the network cable connector (5) in the SEPT and close the lock (4).
6. Install the SEPT power supply connector (1) in the SEPT. and close the lock (2).

NOTE: Make sure that all cables are securely fastened to the SEPT before installing the front cover on the GM18.

7. Install the steel front cover on the GM18.

⋮ About Primozone

At Primozone® we are committed to provide our customers with cost efficient and environmentally friendly ways to clean and treat water with ozone. Our ozone generators and ozone water treatment systems are based on cutting-edge technology and generate far more ozone while using far less energy.

At Primozone we have found an innovative way to make ozone generation efficient and cost effective.

Our solution has proven to save up to 70% of the energy consumption compared to traditional ozone generators. Furthermore the Primozone Ozone Generator is small and has the capacity to generate ozone with a proven high concentration.

Ozone is not only a natural product but also one of the most efficient methods to clean and treat water.

Primozone®
Clean water. The natural way.™